

**Opportunities to Leverage  
Mars Exploration Program Public Engagement  
Projects and Activities**

The *Mars Exploration Program Public Engagement Plan* (April, 2002) lists several HQ-approved education and public outreach activities, with long-term benchmarks over a two-decade period, that serve as focus areas for Mars Public Engagement. In Announcements of Opportunity for Scout missions and for instrument proposals on other Mars Exploration Program missions, NASA's Mars Exploration Program (MEP) requires education and public outreach proposals to align with the *Plan*.

Proposers are welcome to create new and unique activities that support goals, objectives, and areas of focus (e.g., student imaging and analysis, robotics education....) listed in the *Plan* as "threads." Proposers are also encouraged to leverage the overall MEP programmatic investments made in Mars Public Engagement for cost-savings, continuity, extended participant reach, and other benefits. In essence, such leveraging is very similar to the way in which proposers may call upon technical MEP resources and assets (e.g., flight spares, communications assets etc.) to support the success and feasibility of their proposed mission.

Currently, the following Mars Public Engagement projects can be leveraged.<sup>1</sup>

## **FORMAL EDUCATION**

### **Mars Student Imaging Project**

The Mars Student Imaging Project (MSIP) engages student teams (5<sup>th</sup> grade – early college) in the scientific research process by acquiring Mars data using instruments at Mars and analyzing that data. To date, nearly 12,000 students have participated in MSIP both on-site at Arizona State University's Mars Space Flight Facility and via distance learning. ASU's Mars Education Program is Mars Public Engagement's partner for this effort. Odyssey's THEMIS camera and Mars Reconnaissance Orbiter's CTX camera are currently recruited for use within MSIP. MSIP offers a leveraged opportunity for new cameras to be utilized within this program. The Mars Public Engagement Program supports the ongoing management and instructional staffing of MSIP, the distance learning infrastructure at ASU, the training and education of participating student teams, and evaluation. Each proposer planning to participate can assume an additional annual cost of \$22.5K (.3 FTE, educational salary and overhead inclusive) per instrument to cover work at ASU for adapting MSIP's standards-aligned, previously evaluated curricular materials to the characteristics of any new participating instrument(s); working with the science team(s) in designing a protocol for student targeting and data delivery; and, integrating the delivered data into ongoing student

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<sup>1</sup> Note that not all elements in the *Mars Public Engagement Plan* have been fully implemented yet, as it covers some 20 years, and initial start-up efforts have only occurred over the last 4 years since the Plan was signed. Proposers may wish to consider contributing to the development of elements in the *Plan* not listed below (i.e., not yet created or in place, but might be when the selected Scout is in operation); to the best ability, efforts will be made to enable the selected Scout mission to leverage effectively any future Mars Public Engagement projects and infrastructures not currently in place.

team projects (but not serving as instructional staff, which is covered as above). This project qualifies as a Student Collaboration Component (SCC).

### **Mars Exploration Student Data Teams**

The Mars Exploration Student Data Teams (MESDT) Project actively involves high-school students in analyzing science data that complements science team analysis efforts, and can be tailored for any instrument. ASU's Mars Education Program is Mars Public Engagement's partner for this effort. MESDT involved 53 virtual teams (over 700 students) during the initial pilot phase when students used the Mars Global Surveyor TES and Odyssey THEMIS instruments during the Mars Exploration Rover mission. Students monitored the atmosphere for dust storms and changes in atmospheric temperature, and also calculated flyovers when TES and mini-TES could conduct correlated instrument readings. Students will soon use MRO's CRISM spectrometer instrument to monitor regional areas of Mars and suggest targets of interest to the CRISM team. Phoenix will be utilizing this project as well. The Mars Public Engagement Program supports the ongoing management and instructional staffing of MESDT, the distance learning infrastructure at ASU, and evaluation. Each proposer planning to participate can assume an additional annual cost of \$22.5K (.3 FTE, educational salary and overhead) at ASU per instrument, first for customizing curriculum tutorial development for training student teams in the tasks to be accomplished and then for providing an interface between the science team and participating students. A one-time cost of a server, if deemed necessary given the nature of the proposed student work and the relevant data needing to be processed and analyzed, should also be budgeted. If the raw data needs significant transformation for student use, the proposer should also budget technical science team staff support for that translation. This project qualifies as a Student Collaboration Component (SCC).

### **Mars Student Interns**

This effort reaches out to high-school students who are competitively selected to participate on site during mission operations (work conducted is identified in collaboration with science team mentors). The first pilots involved students who worked with the FIDO test rover, then students (14 selected teams of two), who each spent a week at JPL during the first months of Mars Exploration Rover operations. Phoenix will be supporting an interns effort as well. Mars Public Engagement can provide lessons learned, prior evaluation, a process and means of student selection (in coordination with the team), and, if operations are at JPL, staff time for coordination (badging, computer equipment, offices etc.). By contributing educational staff time, Mars Public Engagement will also support instruction of participating students and their teachers in general, standards-aligned, Mars science and engineering content that prepares them for their mission-specific/instrument-specific intern experience. All other costs are the responsibility of the proposer. This effort qualifies as a Student Collaboration Component (SCC).

## **Mars Robotics Education Partnership**

This partnership is more loosely organized than other areas to date. It currently includes connections to NASA's Robotics Alliance and Robotics Curriculum Clearinghouse, classroom activities for elementary and middle-school, a nascent robotics program for Girl Scouts USA, participation by Mars engineering mentors in FIRST Robotics, and funding for student interns in NASA's Robotics Academy and other summer student internship programs sponsored by NASA. Mars Public Engagement can incorporate mission- or instrument-specific content and make connections, but does not have a specific infrastructure to leverage at this time. This project \*may\* qualify as a Student Collaboration Component (SCC), depending on the nature and level of student involvement in actual mission-related robotics and engineering.

## **Imagine Mars Project**

Covering science through the arts, the Imagine Mars Project is designed as an "introductory gateway" to more intensive Mars student imaging and/or robotics education. It is most useful for elementary school teachers and those who may not have strong science backgrounds. It has also found many informal education partners, including HUD Neighborhood Networks (computer learning centers for youth), Girl Scouts, and other after-school programs. Imagine Mars asks students to take a look at their home communities, determine what is going well and what isn't, and design an ideal community on Mars, learning about the martian environment and what technologies would be necessary for survival in the process. (This project thus ties to the Vision as well, linking current robotic exploration with future human exploration.) Mars Public Engagement covers all staff and materials costs for running this project with students nationwide, in collaboration with aforementioned partners. Currently underway is work to characterize various regions on Mars, so that students can become increasingly familiar with the red planet prior to the selection of a location for their imagined community. Mars Public Engagement is covering costs associated with the development of common, interactive tools using accessible and public-friendly 3D maps (e.g., with Google Mars/Sketchup) of areas on Mars on which students can build their imagined communities through user-friendly, architectural-design CAD/CAM software. (This effort contributes to students learning 21st century career skills in computing.) Along with any unique ideas, proposers may wish to consider assuming costs associated with the integration of their data sets and/or science team time helping characterize regions on Mars (verbally and pictorially) in a manner that is appropriate for informal education and online "virtual field trips."

## **Formal Educator Workshops**

Mars Public Engagement is partnered with ASU's Mars Education Program, which has over 15 years of experience in conducting immersive, standards-aligned educator

workshops with national reach. Mars Public Engagement covers staff salaries for workshops and regularly incorporates mission-specific science data and engineering principles as highlights or tools in teaching Mars-related educational standards that students at various grades should know. For mission- and/or instrument-specific workshops, Mars Public Engagement will continue to cover staff salaries, but proposers should budget an additional cost of \$3K per workshop for staff travel and mission- and/or instrument-specific workshop materials.

Research shows that professional development for educators is increased when a hands-on, face-to-face experience is followed with subsequent distance-learning opportunities for reinforcement of concepts. Mars Public Engagement is therefore partnering with the National Science Teachers Association to provide these continued, interactive, online learning opportunities. All costs for integrating mission/instrument content will be covered by Mars Public Engagement.

### **Solar System Educators**

Competitively selected and located in every state, Solar System Educators are trained on Mars-related, standards-aligned, hands-on, inquiry-based classroom activities and then go on to train other teachers in their states/local regions. Costs for training, disseminating materials, and evaluating outcomes are covered by the Mars Public Engagement Program, but proposers should expect to contribute a light amount of science/engineering time for reviewing materials for accuracy and participating in at least an annual telecon during which the educators can ask questions of the team.

## **INFORMAL EDUCATION**

### **Mars Museum Visualization Alliance**

More than 200 museums, science centers, and planetaria are part of this alliance, which has now been made into a single, NASA-wide Museum Alliance. Mars Public Engagement is retaining its focus on delivering high-quality (high-definition where possible), experiential visualizations to the Alliance in near-real-time and as data is later processed. Specially created animations or data processing leading to special image products is the responsibility of the proposer, but Mars Public Engagement funds the technical infrastructure and support staff at JPL's Multi-Image Processing Lab (MIPL) for data delivery to the Alliance for the integration of current science and mission information into their exhibits and programming. Mars Public Engagement covers costs for organizing, running, and recording regular telecons and meetings that provide professional development opportunities for museum staff in Mars and Mars mission content. Mars Public Engagement would also update the Museum Alliance website with key mission events (launch etc.), relevant news, and information about mission-related/instrument-related opportunities. Proposers would contribute a light amount of science/engineering time for those interactions.

## **Mars National Parks Initiative**

Through this initiative, Mars Public Engagement is working with the National Park Service and NASA to partner with parks that serve as analogue environments for Mars. While joint activities can vary depending on the needs and desires of individual parks, Mars Public Engagement covers all HD video filming and editing to create "virtual field trips" to Earth/Mars destinations (for use at the parks and online), mutual professional development opportunities, and coordination staff. Proposers familiar with the geological features of specific parks may wish to contribute their knowledge and expertise in the development of programs and products that create a "martian experience" for park visitors here on Earth.

## **Solar System Ambassadors**

Competitively selected and located in every state, Solar System Ambassadors are trained on Mars-related and other Solar-System content and lead informal education and public outreach events (after-school programming, public talks etc.) Costs for training, disseminating materials, and evaluating outcomes are covered by the Mars Public Engagement Program, but proposers wishing to participate should expect to contribute a light amount of science/engineering time for reviewing materials for accuracy and participating in at least an annual telecon during which the Solar System Ambassadors can ask questions of the team.

## **CROSSCUTTING**

### **Documentary Work**

Mars Public Engagement funds staff and requisite HD camera and editing equipment to create documentaries of the mission, from its inception through development and launch to operations. This work is vital for historical purposes and to give the public a sense of the people and effort that goes into every mission. It is also essential for providing role models to inspire the next generation of explorers to pursue science and engineering careers. This footage is used for many purposes, including media b-roll, web products, museum video content, and supplemental classroom videos. Proposers would largely contribute accessibility to facilities and of team members for interviews.

### **Web Site**

Mars Public Engagement maintains the Mars Exploration Program site, which includes short mission descriptions, links to project and instruments, special features (e.g., image of the day, topic of the month etc.), Mars education content, and profiles of people who make Mars missions possible. Mars Public Engagement will work with the selected Scout mission to provide these items at no additional cost.